CLAIMS

1. A magnetic assembly for an NMR apparatus, including a plurality of primary permanent magnets disposed in an array about an axis (hereafter "longitudinal axis"), the arrangement and/or characteristics of the plurality of magnets being such so as to create a zone of homogeneous magnetic field at some location along the axis forward of the array (and into the material when provided).

2. A magnetic assembly as claimed in claim 1, including a secondary permanent magnet located along the longitudinal axis, at least partly within the array of primary magnets.

3. A magnetic assembly as claimed in claim 2, wherein the position of the secondary permanent magnet is adjustable along the longitudinal axis relative to the primary magnets.

4. A magnetic assembly as claimed in claim 2 or 3, wherein the secondary magnet is a cylindrical bar magnet.

5. A magnetic assembly as claimed in any one of claims 1 to 4, wherein each of the primary magnets has a north and a south pole with an axis extending therebetween, and the primary magnets are arranged such that their axes are oriented at a non-parallel angle to the longitudinal axis of the assembly.

6. A magnetic assembly as claimed in claim 5, wherein each of the plurality of primary magnets is a cylindrical bar magnet, each having a proximal end at a front of the array, and a distal end at a rear of the array.

7. A magnetic assembly as claimed in claim 6, wherein each of the plurality of primary magnets is tilted at an angle relative to the longitudinal axis, such that the configuration of magnets is in a substantially symmetrical tapered arrangement.

8. A magnetic assembly as claimed in claim 7, wherein the tapered arrangement is according to the expression:

$$R = r|\cos\beta|\sqrt{1+\frac{1}{\tan^2\frac{\pi}{N}\cos^2\beta}}+|l\sin\beta|$$

$$t=\sqrt{r^2+\left(\frac{l}{2}\right)^2}\max(|\cos(\beta-\phi)|,|\cos(\beta+\phi)|)$$

where

$$\phi=\tan^{-1}(\frac{2r}{l})$$

N is the number of magnets used,

r is the radius of the magnets,

l is the length of the magnets,

β is the 'cone angle',

R is the 'ring radius',

and t is the distance along the longitudinal axis from the front of the array to the geometric centre of the magnets.

9. A magnetic assembly as claimed claim 7 or 8, wherein the proximal end of each of the plurality of primary magnets is tilted through an angle beta towards the longitudinal axis, such that the configuration of primary magnets is in a substantially symmetrical tapered arrangement, tapering towards the front of the array.

10. A magnetic assembly as claimed in claim 7 or 8, wherein the proximal end of each of the plurality of primary magnets is tilted through an angle beta away from the longitudinal axis, such that the configuration of primary magnets is in a substantially symmetrical tapered arrangement, tapering away from the front of the array.

11. A magnetic assembly as claimed any one of the preceding claims, wherein the plurality of primary magnets is disposed substantially symmetrically about the longitudinal axis.

12. A magnetic assembly as claimed in any one of the preceding claims, wherein the primary magnets are as close together as is physically or reasonably possible.

13. A magnetic assembly as claimed in any one of the preceding claims, wherein each of the plurality of primary magnets is substantially identical.

14. A magnetic assembly as claimed in claim 13 and including a secondary permanent magnet located along the longitudinal axis, at least partly within the array of primary magnets, wherein the secondary magnet is of substantially identical dimensions to each of the plurality of primary magnets.

15. A magnetic assembly as claimed in claim 14, wherein each of the plurality of primary magnets and the secondary magnet is a cylindrical bar magnet having a radius of about 1.8cm and a length of about 5cm.

16. A magnetic assembly as claimed in any one of the preceding claims, including 8 primary magnets.

17. A nuclear magnetic resonance apparatus for one sided access investigations of a material, including a magnetic assembly as claimed in any one of the preceding claims.

18. A nuclear magnetic resonance apparatus as claimed in claim 17, wherein the nuclear magnetic resonance apparatus is portable.

19. A nuclear magnetic resonance apparatus as claimed in claim 17 or 18, operable to provide investigations into a sample at up to about 10cm.

20. A nuclear magnetic resonance apparatus as claimed in any one of claims 17 to 19, wherein the apparatus is operable in such a fashion as to allow excitation of one volume V_a of the material, being one of a plurality of volumes V_1 to V_n existing as slices along the longitudinal axis.

21. A nuclear magnetic resonance apparatus as claimed in claim 20, wherein the apparatus is operable to, following excitation of V_a then allow excitation of a second volume V_b being one of the plurality of volumes V_1 to V_n substantially immediately after excitation of V_a.

22. A nuclear magnetic resonance apparatus for one sided access investigations of a material, including a plurality of primary permanent magnets disposed in an array about an axis (hereafter "longitudinal axis"), and a secondary permanent magnet located along the longitudinal axis, at least partly within the array of primary magnets, the position of the secondary permanent magnet being adjustable along the longitudinal axis relative to the primary magnets, the arrangement and/or characteristics of the magnets being such so as to create a zone of homogeneous magnetic field at some location along the axis forward of the array (and into the material when provided).

23. A method of studying the magnetic resonance of a material including the steps of:

a) employing an NMR apparatus as claimed in any one of claims 17 to 22;

b) generating a sufficiently homogeneous magnetic field over a volume V_a located at a location along the longitudinal axis in the material thereby causing excitation of subject nuclei in the volume V_a; and

c) detecting radio frequency emissions from the subject nuclei in the volume V_a.

24. A method of studying the magnetic resonance of a material as claimed in claim 23, comprising or including, subsequent to step c):

d) substantially immediately following excitation of volume V_a, causing excitation of subject nuclei in a volume V_b, wherein V_b is a volume differing from V_a only in its position along the longitudinal axis; and

e) detecting radio frequency emissions from the subject nuclei in the volume V_b.